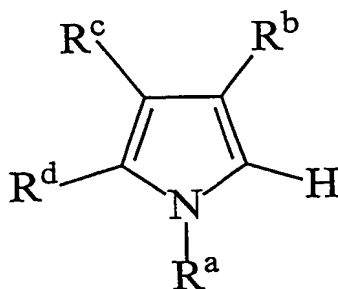


## Claims

1. An organometallic compound obtainable by contacting:

a) a compound having the following formula (I):



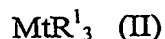
(I)

wherein:

R<sup>a</sup> is a linear or branched, saturated or unsaturated, C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> arylalkyl or C<sub>7</sub>-C<sub>20</sub> alkylaryl group, optionally containing O, S, N, P, Si or halogen atoms; or R<sup>a</sup> can join R<sup>d</sup> to form a C<sub>4</sub>-C<sub>7</sub> ring;

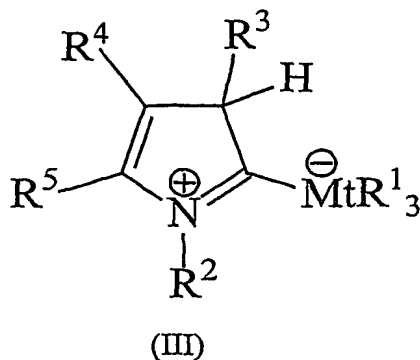
R<sup>b</sup>, R<sup>c</sup> and R<sup>d</sup>, equal to or different from each other, are hydrogen atoms, halogen atoms, linear or branched, saturated or unsaturated, C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> arylalkyl or C<sub>7</sub>-C<sub>20</sub> alkylaryl groups, optionally containing O, S, N, P, Si or halogen atoms, or two or more adjacent substituents R<sup>b</sup>, R<sup>c</sup>, and R<sup>d</sup> form one or more C<sub>4</sub>-C<sub>7</sub> rings, optionally containing O, S, N, P or Si atoms, that can bear substituents; with

b) a Lewis acid of formula (II)



wherein Mt is a metal belonging to Group 13 of the Periodic Table of the Elements; R<sup>1</sup>, equal to or different from each other, are halogen atoms, halogenated C<sub>6</sub>-C<sub>20</sub> aryl and halogenated C<sub>7</sub>-C<sub>20</sub> alkylaryl groups; two R<sup>1</sup> groups can also form with the metal Mt one condensed ring.

2. The organometallic compound according to claim 1 wherein: Mt is B or Al; and the substituents R<sup>1</sup> are C<sub>6</sub>F<sub>5</sub>, C<sub>6</sub>F<sub>4</sub>H, C<sub>6</sub>F<sub>3</sub>H<sub>2</sub>, C<sub>6</sub>H<sub>3</sub>(CF<sub>3</sub>)<sub>2</sub>, perfluoro-biphenyl, heptafluoro-naphthyl, hexafluoro-naphthyl or pentafluoro-naphthyl.
3. The organometallic compound according to claim 1 having formula (III):

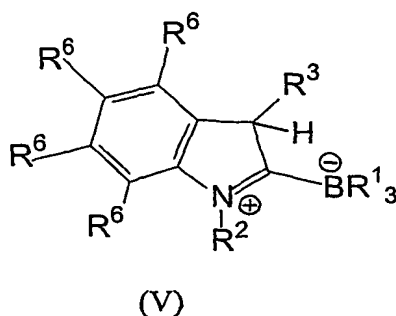


wherein:

Mt is a metal belonging to Group 13 of the Periodic Table of the Elements (IUPAC); R<sup>1</sup>, equal to or different from each other, are halogen atoms, halogenated C<sub>6</sub>-C<sub>20</sub> aryl or halogenated C<sub>7</sub>-C<sub>20</sub> alkylaryl groups; or two R<sup>1</sup> groups can form with the metal Mt one condensed ring; the substituents R<sup>5</sup>, R<sup>4</sup> and R<sup>3</sup> equal to or different from each other, are hydrogen atoms, halogen atoms, linear or branched, saturated or unsaturated, C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> arylalkyl or C<sub>7</sub>-C<sub>20</sub> alkylaryl groups, optionally containing O, S, N, P, Si or halogen atoms, or two or more adjacent substituents R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> form one or more C<sub>4</sub>-C<sub>7</sub> rings, optionally containing O, S, N, P or Si;

R<sup>2</sup> is a linear or branched, saturated or unsaturated, C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> arylalkyl or C<sub>7</sub>-C<sub>20</sub> alkylaryl group, optionally containing O, S, N, P, Si or halogen atoms or R<sup>2</sup> can join R<sup>5</sup> to form a C<sub>4</sub>-C<sub>7</sub> ring.

4. The organometallic compound according to claim 3 wherein Mt is B or Al; the substituents R<sup>1</sup> equal to or different from each other, are C<sub>6</sub>F<sub>5</sub>, C<sub>6</sub>F<sub>4</sub>H, C<sub>6</sub>F<sub>3</sub>H<sub>2</sub>, C<sub>6</sub>H<sub>3</sub>(CF<sub>3</sub>)<sub>2</sub>, perfluoro-biphenyl, heptafluoro-naphthyl, hexafluoro-naphthyl or pentafluoro-naphthyl; R<sup>4</sup> and R<sup>5</sup> form one C<sub>5</sub>-C<sub>6</sub> aromatic ring, optionally containing O, S, N, or P atoms, that can bear substituents; R<sup>2</sup> is a C<sub>1</sub>-C<sub>10</sub> alkyl or C<sub>6</sub>-C<sub>20</sub> aryl group; and R<sup>3</sup> is hydrogen.
5. The organometallic compound according to claims 3 or 4 having formula (V):

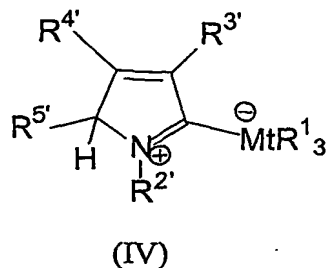


wherein

B is a boron atom;

the substituents  $R^1$ ,  $R^2$  and  $R^3$  have the meaning reported in claim 3 or 4 and the substituents  $R^6$ , the same or different from each other, are hydrogen atoms, halogen atoms, linear or branched, saturated or unsaturated,  $C_1$ - $C_{10}$  alkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  arylalkyl or  $C_7$ - $C_{20}$  alkylaryl groups optionally containing O, S, N, P, Si or halogen atoms, or two or more adjacent substituents  $R^6$  form one or more  $C_4$ - $C_7$  optionally containing O, S, N, P or Si atoms rings that can bear substituents.

6. The organometallic compound according to claim 1 having formula (IV):



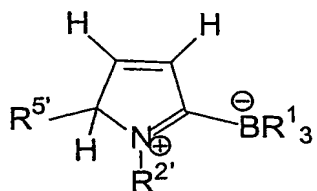
wherein

Mt and  $R^1$  are defined as in claim 1;

the substituents  $R^3$ ,  $R^4$  and  $R^5$  equal to or different from each other, are hydrogen atoms, halogen atoms, linear or branched, saturated or unsaturated,  $C_1$ - $C_{10}$  alkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  arylalkyl or  $C_7$ - $C_{20}$  alkylaryl groups, optionally containing O, S, N, P, Si or halogen atoms, or two or more adjacent substituents  $R^3$ ,  $R^4$  and  $R^5$  form one or more  $C_4$ - $C_7$  rings optionally containing O, S, N, P or Si atoms, that can bear substituents; said rings can be aliphatic or optionally can contain double bonds; with the proviso that said rings are not aromatic;

$R^2$  is a linear or branched, saturated or unsaturated,  $C_1$ - $C_{10}$  alkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  arylalkyl or  $C_7$ - $C_{20}$  alkylaryl group, optionally containing O, S, N, P, Si or halogen atoms; or  $R^2$  can join  $R^5$  to form a  $C_4$ - $C_7$  ring.

7. The organometallic compound according to claim 6 wherein  $R^2$  is a  $C_1$ - $C_{10}$  alkyl, or  $C_6$ - $C_{20}$  aryl group; the substituents  $R^3$ ,  $R^4$  and  $R^5$  equal to or different from each other, are hydrogen atoms, linear or branched, saturated or unsaturated,  $C_1$ - $C_{10}$  alkyl, optionally containing O, S, N, P, Si or halogen atoms, or two or more adjacent substituents  $R^3$ ,  $R^4$  and  $R^5$  form one or more  $C_4$ - $C_7$  rings optionally containing O, S, N, P or Si atoms, that can bear substituents; said rings can be aliphatic or optionally can contain double bonds, with the proviso that said rings are not aromatic.
8. The organometallic compound according to claims 6 or 7 having formula (VI):

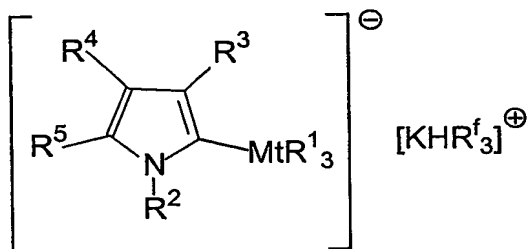


(VI)

wherein

the substituents  $R^1$  and  $R^{2'}$  have the meaning as described in claims 6 or 7 above and the substituent  $R^{5'}$  is a  $C_1$ - $C_{20}$  alkyl group.

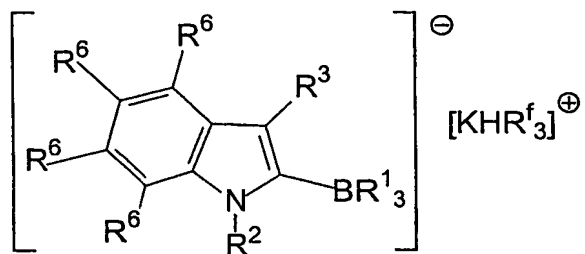
9. A salt obtainable by contacting, in any order:
  - a) a compound having formula (I) as described in claim 1;
  - b) a Lewis acid of formula (II) as described in claim 1; and
  - c) a compound of formula  $KR^f_3$  wherein K is a nitrogen (N) or phosphorous (P) atom;  $R^f$ , equal to or different from each other, are linear or branched, saturated or unsaturated,  $C_1$ - $C_{30}$  alkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  arylalkyl or  $C_7$ - $C_{20}$  alkylaryl groups, optionally containing O, S, N, P, Si or halogen atoms, or two  $R^f$  can form one  $C_4$ - $C_7$  ring, optionally containing O, S, N, P or Si atoms, that can bear substituents.
10. The salt according to claim 9 wherein K is nitrogen; and  $R^f$  is selected from the group consisting of linear or branched, saturated or unsaturated,  $C_1$ - $C_{30}$  alkyl.
11. The salt according to claim 9 having formula (VII):



(VII)

wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ , are described in claim 3; and Mt, K and  $R^f$  are described in claim 9.

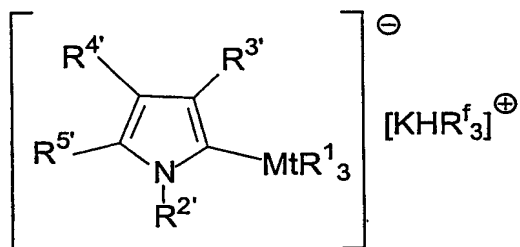
12. The salt according to claim 11 having formula (IX):



(IX)

wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^6$ , B, K and  $R^f$  have the meaning as described in claim 11.

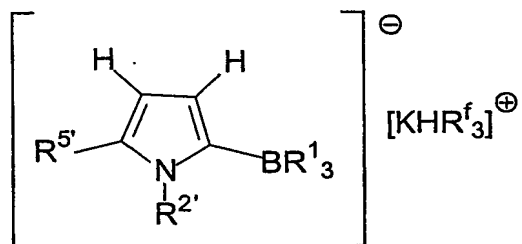
13. The salt according to claim 9 having formula (VIII):



(VIII)

wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ , are described in claim 6, and Mt, K and  $R^f$  are described in claim 9.

14. The salt according to claim 13 having formula (X):

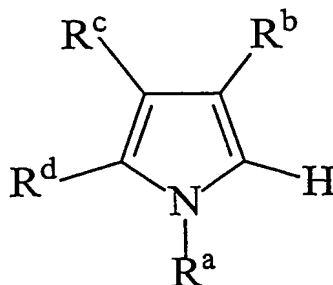


(X)

wherein  $R^1$ ,  $R^2$ ,  $R^5$ , B, K and  $R^f$  have the meaning as described in claim 13.

15. A catalyst system for the polymerization of olefins comprising the product obtained by contacting:

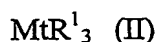
- (A) at least one transition metal organometallic compound, and
- (B) an organometallic compound obtainable by contacting:
  - a) a compound having the following formula (I):



(I)

wherein R<sup>a</sup>, R<sup>b</sup>, R<sup>c</sup> and R<sup>d</sup> are described as in claim 1;

b) a Lewis acid of formula (II)



wherein Mt and R<sup>1</sup> are described as in claim 1; and

c) optionally a compound of formula KR<sup>f</sup><sub>3</sub> wherein K and R<sup>f</sup> are described as in claim 9.

16. The catalyst system according to claim 15 further comprising an alkylating agent.
17. The catalyst system according to anyone of claims 15 or 16 wherein the organometallic compound B) has formula (III) (V) (IV) (VI) (VII) (IX) (VIII) or (X) wherein these compounds are described in claims 2-17.
18. The catalyst system according to anyone of claims 15-17 wherein the transition metal organometallic compound is a metallocene compounds belonging to the following formula (XI)



wherein (ZR<sup>7</sup><sub>m</sub>)<sub>n</sub> is a divalent group bridging Cp and A; Z being C, Si, Ge, N or P, and the R<sup>7</sup> groups, equal to or different from each other, being hydrogen or linear or branched, saturated or unsaturated C<sub>1</sub>-C<sub>20</sub> alkyl, C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkylaryl or C<sub>7</sub>-C<sub>20</sub> arylalkyl groups or two R<sup>7</sup> can form a aliphatic or aromatic C<sub>4</sub>-C<sub>7</sub> ring;

Cp is a substituted or unsubstituted cyclopentadienyl group, optionally condensed to one or more substituted or unsubstituted, saturated, unsaturated or aromatic rings, containing from 4 to 6 carbon atoms, optionally containing one or more heteroatoms;

A is O, S, NR<sup>8</sup>, PR<sup>8</sup> wherein R<sup>8</sup> is hydrogen, a linear or branched, saturated or unsaturated C<sub>1</sub>-C<sub>20</sub> alkyl, C<sub>3</sub>-C<sub>20</sub> cycloalkyl, C<sub>6</sub>-C<sub>20</sub> aryl, C<sub>7</sub>-C<sub>20</sub> alkylaryl or C<sub>7</sub>-C<sub>20</sub> arylalkyl, or A has the same meaning of Cp;

M is a transition metal belonging to group 4, 5 or to the lanthanide or actinide groups of

the Periodic Table of the Elements;

the substituents L, equal to or different from each other, are monoanionic sigma ligands selected from the group consisting of hydrogen atoms, halogen atoms,  $R^9$ ,  $OR^9$ ,  $OCOR^9$ ,  $SR^9$ ,  $NR^9_2$  and  $PR^9_2$ , wherein  $R^9$  is a linear or branched, saturated or unsaturated  $C_1$ - $C_{20}$  alkyl,  $C_3$ - $C_{20}$  cycloalkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  alkylaryl or  $C_7$ - $C_{20}$  arylalkyl group, optionally containing one or more Si or Ge atoms;

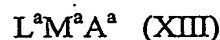
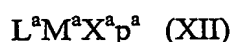
$m$  is 1 or 2, and more specifically it is 1 when Z is N or P, and it is 2 when Z is C, Si or Ge;

$n$  is an integer ranging from 0 to 4;

$r$  is 0, 1 or 2;  $n$  is 0 when  $r$  is 0;

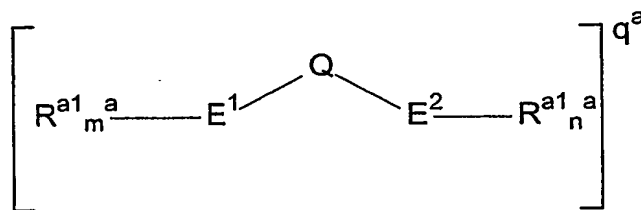
$p$  is an integer equal to the oxidation state of the metal M minus  $r+1$ .

19. The catalyst system according to anyone of claims 15-17 wherein the transition metal organometallic compound is a late transition metal complex of formula (XII) or (XIII)



wherein  $M^a$  is a metal belonging to Group 8, 9, 10 or 11 of the Periodic Table of the Elements;

$L^a$  is a bidentate or tridentate ligand of formula (XIV):



(XIV)

wherein:

Q is a  $C_1$ - $C_{50}$  bridging group linking  $E^1$  and  $E^2$ , optionally containing one or more atoms belonging to Groups 13-17 of the Periodic Table;

$E^1$  and  $E^2$ , the same or different from each other, are elements belonging to Group 15 or 16 of the Periodic Table and are bonded to said metal  $M^a$ ;

the substituents  $R^{a1}$ , equal to or different from each other, are selected from the group consisting of hydrogen, linear or branched, saturated or unsaturated  $C_1$ - $C_{20}$  alkyl,  $C_3$ - $C_{20}$  cycloalkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  alkylaryl and  $C_7$ - $C_{20}$  arylalkyl radicals, optionally containing one or more atoms belonging to groups 13-17 of the Periodic Table of the

Elements; or two  $R^{a1}$  substituents attached to the same atom  $E^1$  or  $E^2$  form a saturated, unsaturated or aromatic  $C_4$ - $C_7$  ring, having from 4 to 20 carbon atoms;  $m^a$  and  $n^a$  are independently 0, 1 or 2, depending on the valence of  $E^1$  and  $E^2$ , so to satisfy the valence number of  $E^1$  and  $E^2$ ;  $q^a$  is the charge of the bidentate or tridentate ligand so that the oxidation state of  $M^aX_p^aX_s^a$ , or  $M^aA^a$  is satisfied, and the compound (XII) or (XIII) is overall neutral;

$X^a$ , the same or different from each other, are monoanionic sigma ligands selected from the group consisting of hydrogen, halogen,  $R^a$ ,  $OR^a$ ,  $OSO_2CF_3$ ,  $OCOR^a$ ,  $SR^a$ ,  $-NR^a_2$  and  $PR^a_2$  groups, wherein the  $R^a$  substituents are linear or branched, saturated or unsaturated,  $C_1$ - $C_{20}$  alkyl,  $C_3$ - $C_{20}$  cycloalkyl,  $C_6$ - $C_{20}$  aryl,  $C_7$ - $C_{20}$  alkylaryl or  $C_7$ - $C_{20}$  arylalkyl radicals, optionally containing one or more atoms belonging to groups 13-17 of the Periodic Table of the Elements; or two  $X^a$  groups form a metallacycle ring containing from 3 to 20 carbon atoms;

$p^a$  is an integer ranging from 0 to 3, so that the final compound (XII) or (XIII) is overall neutral; and

$A^a$  is a  $\pi$ -allyl or a  $\pi$ -benzyl group.

20. A process for the polymerization of one or more olefins comprising contacting one or more olefins under polymerization conditions in the presence of a catalyst system as described in claim 15.